REMARKS

Claims 1-21 are rejected under 35 U.S.C. Section 103(a) as being unpatenable over U.S. Patent 5,209,829 to Gondel et al. (Gondel et al.) in view of alleged prior art at page 2, lines 4-14 of the subject application. Similarly, claims 22-23 are rejected under 35 U.S.C. Section 103(a) as being unpatentable over U.S. Patent 3,850,712 to Broughton et al. (Broughton et al.) in view of the afore-referenced alleged prior art and further in view of U.S. Patent 5,705,082 to Hinson (Hinson).

The foregoing rejections are respectfully disagreed with, and are traversed below.

Independent claim 1 is directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component. The process consists essentially of the sequential steps of: immersing at least a portion of the titanium-based component, which has been subjected to engine operation, into an acid solution to form an etched component, the acid solution comprising sodium fluoride, sulphuric acid and water; removing the etched component from the solution; and visually inspecting the etched component for dark areas in contrast to light areas, the dark areas indicating deposited aluminum-based material.

Independent claim 12 is directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component, consisting essentially of the sequential steps of: immersing, for between about 45 seconds and about 3 minutes, at least a portion of the titanium-based component, which has been subjected to engine operation, into an acid solution to form an etched component, the acid solution comprising, per liter: i) about 15 g/liter of sodium fluoride; ii) about 75 g/liter of sulphuric acid having a density of about 1.84; and iii) balance water; removing the etched component from the solution; washing the etched component in water, followed by drying; and

visually inspecting the etched component under magnified conditions for dark areas in contrast to light areas, the dark areas indicating deposited aluminum-based material.

Similarly, independent claim 19 is directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component, consisting essentially of the sequential steps of: swab etching at least a portion of the titanium-based component, which has been subjected to engine operation, with an acid solution to form an etched component, the acid solution comprising sodium fluoride, sulphuric acid and water; and visually inspecting the etched component for dark areas in contrast to light areas, the dark areas indicating deposited aluminum-based material.

Claims 2-11, 13-18, 20-21 and 24 each depend from an independent claim and recite further detailed features of the claimed invention.

New claim 25 is directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component, consisting of the sequential recited steps of immersing, removing and visually inspecting.

Applicant's invention provides a much needed solution to a problem encountered in the art. As disclosed in Applicant's specification at page 2, severe rubs may result in over heating of the blade tip with a range of conditions varying from associated color tint on the tip, transformation of the blade tip microstructure to deformation of the blade tip. However, there are no visual indications for blades that experience mild contact into the AlSi coating resulting in the deposit of aluminum on the blade. Such deposit onto the blades is aerodynamically undesirable and may result in decreased engine performance and efficiency. Thus, if a blade rub is suspected, all of the blades are removed from the engine and replaced.

Applicant asserts that Gondel et al. does not disclose nor suggest the presently claimed invention, whether viewed alone or in any combination. Gondel et al. do not even recognize

the problem solved by the present invention. In particular, the Gondel et al. reference is directed to the well known many stepped "blue etch" electro-chemical etching process for detecting melt/forging defects during part manufacture as opposed to detecting aluminum deposited on parts during engine service. See Column 1, lines 20 to 53 and the enumerated 11 steps therein. Gondel et al. disclose an acid etching bath for activating titanium alloys "before macrographic anodic oxidation in an electro-chemical process comprising, in succession, the steps of degreasing, rinsing, activation by acid etching, rinsing, anodic oxidation in a trisodium phosphate bath, rinsing, and development by etching in a nitrohydrofluoric bath (Col. 2, line 33-45).

Thus, Gondel et al. are merely concerned with improving one of the numerous steps in the "blue etch" process to, e.g., improve the automation of the process and also reduce the cost of the procedure. (Col. 2, lines 27-68).

More particularly, the Gondel et al. reference is a patent for a specific formulation of an "activation" solution, which is only one of the process steps in the blue etch, anodize process. This patent specifically defines the activation etching solution to be used as a pretreatment before conducting the electrical anodize operation. No attempt is made by Gondel et al. to inspect a part after immersion in their "activation" solution. In addition, the blue etch process that is referenced by Gondel et al. is an inspection of parts for melting or forging or processing defects, i.e. defects or nonconformances that occur during the manufacture of the part. The manufacturing defects result in local segregation that is identified by the blue etch process. The blue etch process requires the entire part to be processed.

Thus, the Gondel et al. patent is concerned with an entirely different process than that of the present invention, and is also looking for a completely different condition than that of the present invention.

In contrast to Gondel et al., the subject claims are directed to an inspection for detecting aluminum that is deposited on parts during engine service. It is not an inspection for identifying manufacturing defects on parts. Applicant's inspection process is also looking for a different condition (aluminum deposited during engine operation) than the blue etch

inspection (melt/forging defects during part manufacture). Thus, Gondel et al. does not apply for at least this reason.

Additionally, while the blue etch inspection is a multi stage process comprised of:

- Alkaline cleaning
- Activation etch
- Electrical anodizing
- Acid back strip
- Hot water soak
- Inspection

and requires the entire part to be immersed in each process solution, embodiments of the present invention may include only:

- Acid etch
- Water rinse
- Inspection

and can be conducted either on the entire part or locally in one small area of the part.

Gondel et al. do not disclose nor suggest that, for example, anodic oxidation in a trisodium phosphate bath or development by etching in a nitrohydrofluoric bath may be eliminated in its electro-chemical etching ("blue etch") process. Thus, these steps appear to be essential to the process disclosed therein.

In contrast, Applicant's claimed process does not employ such additional steps, as indicated by the specification and the employed "consisting essentially of" and "consisting of" wording of the independent claims, which are directed to the recited "sequential" steps.

Such further processing steps would materially change the characteristic's of the claimed invention. As disclosed in Applicant's specification at page 6, an advantage of Applicant's invention is that it may readily and quickly reveal component rub or exposure to an aluminum-based material without the requirement of further processing of the part for inspection.

As also disclosed at page 6 of Applicant's specification, a further advantage is in providing a nondestructive inspection technique that has minimal steps and is cost effective to implement. The inspection may be set up easily and inexpensively, without the need for special, complicated equipment. This does not appear to be the case in Gondel et al., which again disclose the 11 step "blue etch" process requiring anodic oxidation and etching in a nitrohydrofluoric bath, among the other many steps prior to reading the manufacturing defects.

Applicant further respectfully points out that:

1. The Gondel et al. patent applies to a pretreatment operation of the blue etch process;
2. No inspection of the part is conducted following immersion in the Gondel et al. solution;
3. The Gondel et al. patent requires the entire part to be immersed;
4. The Gondel et al. patent is inspecting the part for an entirely different nonconforming condition than the subject invention; and
5. The Gondel et al. patent applies to manufacturing defects.

Gondel et al., alone or in any combination, do not disclose or suggest, Applicant's claimed method "consisting essentially of "and "consisting of" the particular sequential steps recited therein.

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection of claims 1-21.

Independent claim 22 is also directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component. The process consists essentially of the sequential steps of: immersing at least a portion of the titanium-based component, which has been subjected to engine operation, into an acid solution to form an etched component, the acid solution comprising calcium fluoride, potassium fluoride or hydrofluoric acid; sulphuric acid; and water; removing the etched component from the solution; and visually inspecting the etched component for dark areas in contrast to light areas, the dark areas indicating deposited aluminum-based material.

Similarly, independent claim 23 is directed to a process for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation when there is not a visual indication of at least a portion of the aluminum-based material on the component, consisting essentially of the sequential steps of: swab etching at least a portion of the titanium-based component, which has been subjected to engine operation, with an acid solution to form an etched component, the acid solution comprising calcium fluoride, potassium fluoride or hydrofluoric acid; sulphuric acid; and water; and visually inspecting the etched component for dark areas in contrast to light areas, the dark areas indicating deposited aluminum-based material.

Applicant respectfully asserts that the cited patents neither disclose nor suggest the presently claimed process for at least the following reasons. Broughton et al. disclose a solution with an entirely different formulation than the solution set forth in claims 22-23. Broughton et al. disclose a solution of nitric acid, hydrofluorosilic acid and water. This does not disclose nor suggest Applicant's claimed acid solution or the sequential process steps for detecting an aluminum-based material deposited onto a titanium-based gas turbine engine component during engine operation where there is not a visual indication of at least a portion of the aluminum-based material on the component as recited in claims 22-23.

The addition of Hinson does not cure the shortcomings of Broughton et al. That is, Hinson is directed to roughening of metal surfaces to improve the adhesive bond between components in the fabrication of a completed unit. See Col. 1. It is asserted that one skilled in the art seeking to develop Applicant's claimed process would not be motivated to look for Hinson for guidance. Moreover, in Hinson's roughening process, a list of etchants are merely disclosed at column 4 which may be used to "produce the roughened metal surface."

It is respectfully asserted that the teachings of Hinson do not disclose nor suggest Applicant's claimed acid solution or the sequential process step recited in claims 23 and 24, whether this reference is viewed alone or in combination.

Applicant respectfully asserts that there is no teaching, suggestion or motivation that would lead one of ordinary skill in the art to combine and then modify the afore-described teachings in an attempt to arrive at the present claims. Without such a teaching or suggestion, the invention may only be considered obvious in hindsight, which is an improper basis for rejection.

All issues raised by the Examiner having been addressed, the subject patent application is believed to be in condition for immediate allowance. Accordingly, the Examiner is respectfully requested to reconsider and remove all of the outstanding rejections and to pass this patent application to issuance.

A call to the undersigned attorney at the telephone number listed below would be appreciated should the Examiner have any questions or believe that a discussion would advance the prosecution of the application.

Respectfully submitted:

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